

# ENERGY STAR TRANSFORMER PROGRAM

PROMOTING  
COMPETITIVENESS &  
ENVIRONMENTAL QUALITY  
FOR AMERICA'S  
ELECTRIC UTILITIES



# ENERGY STAR TRANSFORMERS

Eliminating the emissions associated with transformer energy losses would be the **equivalent** of

removing the annual CO<sub>2</sub> emissions from 6.0 million cars



or



planting 12.3 million acres of trees.

## WHAT IS THE ENERGY STAR TRANSFORMER PROGRAM?

The ENERGY STAR Transformer Program is a *voluntary*, EPA-sponsored effort to recognize electric utilities that make a commitment to purchasing high-efficiency distribution transformers.

The program requirements for utility members are simple.



### PARTNERS AGREE TO:

**Perform** economic analysis of total transformer-owning costs — including the purchase price and the cost of energy losses — using a standard industry methodology; and

**Buy** transformers that meet EPA's ENERGY STAR guidelines *only when they are cost-effective*.

## WHY ENERGY STAR TRANSFORMERS?

Distribution transformers are one of the most widely used elements of America's electric distribution systems. Transformers **convert electricity** from the high voltage levels on utility transmission systems to voltages that can be used in businesses and homes.

Over 40 million distribution transformers are currently in service on electric utility distribution systems, and utilities nationwide purchase more than one million new units annually. Transformers are a **crucial link** in the utility industry's efforts to bring American consumers safe, reliable, and cost-effective electricity.

One of the most striking features of transformers is their dependability and long service lives. On average, transformers remain in service for over 30 years, during which time they perform their vital function reliably and with little degradation in service quality. Amazingly enough, many transformers operate at **efficiency levels** that often **exceed 98 percent**.

"With this program, we can limit the impact on the environment, improve economic efficiency, and lower customer bills. This is an example of an effective partnership between the electric utility industry and government."

*Thomas R. Kuhn, President, Edison Electric Institute*



Transformers lose over 61 billion kilowatt-hours of electricity per year.



2 percent of total U.S. annual generation is lost.



ENERGY STAR technologies reduce electricity losses by 10 to 40 percent.



# TRANSFORMERS AND THE ENVIRONMENT

## TRANSFORMER IMPACTS

Despite those high average efficiencies, transformers have a significant environmental impact. Consider these facts:

- ★ Nationwide, over **two percent** of total U.S. annual generation — roughly 61 billion kilowatt-hours of electricity — is lost each year due to transformer inefficiencies.

That means the average utility generates or purchases energy for **eight days** each year just to replace energy lost through utility distribution transformer inefficiencies.

- ★ The resulting emission levels due to these transformer losses are enormous:

**45** million tons CO<sub>2</sub>

**353** million kilograms SO<sub>2</sub>

**152** million kilograms NO<sub>x</sub>

- ★ These emissions are the equivalent to the annual CO<sub>2</sub> emissions from 6.0 million cars or the annual CO<sub>2</sub> absorbed by 12.3 million acres of trees.

## THE ENVIRONMENTAL BENEFITS OF HIGH-EFFICIENCY TRANSFORMERS

Transformer energy losses can be reduced *cost-effectively* by 10 to 40 percent using a variety of available transformer technologies, notwithstanding the already high average efficiency of new transformers. These small efficiency improvements can dramatically reduce energy losses and emission levels associated with distribution transformers.

- ★ **A one-tenth of one percent gain** in the average efficiency of utility transformers **installed in a single year** would produce:

 **Energy Savings:**  
**2.9** billion kilowatt hours

 **Emission Reductions:**

**1.8** million tons CO<sub>2</sub>

**13** million kilograms SO<sub>2</sub>

**5** million kilograms NO<sub>x</sub>

- ★ The emission reductions would be the equivalent of removing **240,000** automobiles from the road for one year.
- ★ The best news about high-efficiency transformers is that the technologies which produce these efficiency gains are already in widespread use by the utility industry and pose no threat to the reliability or safety of utility distribution systems. System planners can realize **economic and environmental gains** and reduce costs while maintaining or improving system reliability.



Greenhouse gas emissions will be reduced to 1990 levels by the year 2000 through voluntary actions.



ENERGY STAR Transformer Program

helps achieve this goal...



While improving utility competitiveness and customer service.



# WHAT CAN ELECTRIC UTILITIES DO?

## JOIN THE ENERGY STAR TRANSFORMER PROGRAM

The ENERGY STAR Transformer Program is a voluntary energy efficiency program designed to encourage utilities to purchase and install high-efficiency, cost-effective transformers on their distribution systems. The Program promotes the



A 1/10 of one percent efficiency gain in the annual transformer sales to utilities would be the equivalent of removing **240,000 automobiles** from the road for one year.

best practices in the utility industry and recognizes those utilities that have made a commitment to high-efficiency transformers.

The ENERGY STAR Transformer Program is one of the action steps in the U.S. Climate Change Action Plan (CCAP). The CCAP calls for **voluntary, profitable** actions that will help the United States reduce its greenhouse gas emissions to 1990 levels by the year 2000.

Like other programs in the Action Plan, the ENERGY STAR Transformer Program relies on the ingenuity and technical know-how of U.S. industries to both improve the economy and protect the environment.

In addition, the ENERGY STAR Transformer Program is listed as one of the options in the Climate Challenge Program. Climate Challenge is a joint effort of the Department of Energy (DOE) and the U.S. electric utility industry to reduce greenhouse gas emissions. Hundreds of utilities have joined the Program and are actively developing plans to cost-effectively achieve their emission reductions.

"This must be a call, not for more bureaucracy or regulation or unnecessary costs, but instead for American ingenuity and creativity, to produce the best and most energy-efficient technology."

*President Clinton, The Climate Change Action Plan, October 1993*

# HIGH-EFFICIENCY TRANSFORMERS: A GOOD INVESTMENT

As the utility industry enters an era of increased competition, utilities must find ways to cut costs while improving the quality of service to their customers. EPA has recognized that the ENERGY STAR Transformer Program must reflect current industry needs. The Program has many advantages:

- ★ Low administrative effort
- ★ Evaluation method mirrors standard utility practices
- ★ ENERGY STAR is part of the normal procurement process
- ★ Reporting is minimal
- ★ Virtually all manufacturers can produce ENERGY STAR Transformers
- ★ Supplier competition means more options and lower prices
- ★ Choice of manufacturers means no loss of supply security and diversity

Another attractive feature of high-efficiency transformers is that they can help utilities fulfill a variety of strategic aims, including the following:

- ★ Recent studies show the cost of energy saved from high-efficiency transformer use can be as low as 1.5 cents per kilowatt-hour, compared to an average cost of three cents for new generation.
- ★ Transformers improve the efficiency of utility distribution systems, which will be a key determinant of utility competitiveness in the era of competition and incentive rate making.
- ★ Transformer energy savings are easily verified.

The cost of energy saved can be **as low as 1.5 cents per kilowatt-hour**, compared to an average cost of three cents for new generation.



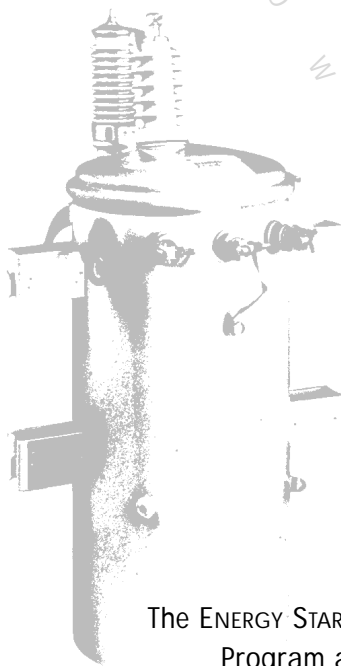
## REDUCED SYSTEM OPERATING COSTS

- ★ Because utilities participating in the Program make a commitment to use best management practices in transformer evaluation and to purchase ENERGY STAR Transformers *only when cost-effective*, utilities and their customers are assured of getting the highest transformer values available.



NEW  
GENERATION

ENERGY  
STAR



The ENERGY STAR Transformer Program aims to **enhance environmental performance** through the use of efficient, cost-effective technologies.



## **LOW-COST ENVIRONMENTAL GAINS**

- ★ Utilities purchase transformers based on hard economic costs (such as avoided energy and capacity costs). What is often left out of these equations is the cost of air emissions (such as CO<sub>2</sub> and NO<sub>x</sub>).
- ★ Thus, the emission reductions resulting from high-efficiency transformer use come at no cost to the utility.

## **IMPROVED CUSTOMER SERVICE**

- ★ High-efficiency transformers help utilities avoid costly system upgrades, which can help keep utility costs down for all customers.
- ★ All ratepayers enjoy the benefits of increased transformer efficiencies, thereby avoiding the inter-customer equity effects that can result from other efficiency programs.

## **RELIABLE LOAD REDUCTION**

- ★ Because high-efficiency transformers provide reliable and consistent efficiency gains, system planners can use them with confidence to relieve system constraints and to provide real energy savings for many years in the future.

# ENERGY STAR PARTNER BENEFITS

## ENERGY STAR TRANSFORMER PROGRAM BENEFITS

As a Partner in the ENERGY STAR Transformer Program, your company will have access to valuable communication, public recognition, and technical resources provided by EPA.

### PUBLIC RECOGNITION

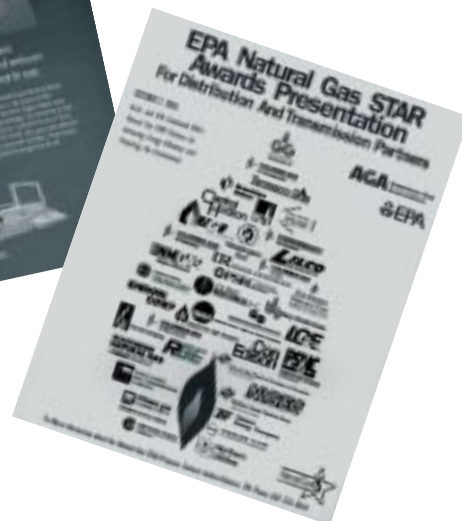
A critical element of EPA's voluntary pollution prevention program is the highly visible recognition of our Partners' environmental efforts. As part of the ENERGY STAR Transformer Program commitment, your company can use the ENERGY STAR Transformer logo<sup>SM</sup> in reports and press releases to inform your customers about your environmental success. In addition, EPA is committed to developing prototype materials designed to recognize participants' commitments to the environment and to build public and regulatory support for their efforts.

### TECHNICAL TOOLS

A second critical component of the ENERGY STAR Transformer Program is the technical assistance and resources provided to Partners to increase the profitability of their high-efficiency transformer purchases. The following represent a sampling of tools available from EPA.

### *Transformer Sizing Study and Software Development*

Working with a major utility association, EPA has developed a technical program to assist electric utilities' efforts to ensure that distribution transformers are not oversized. Anecdotal evidence gathered from utilities to date indicates that between 20 and 50 percent of all utility distribution transformers may currently be oversized. This technical tool will enable member utilities in the ENERGY STAR Transformer Program to reduce the costs of their transformer purchases while purchasing high-efficiency transformers.



EPA public recognition pieces



### ***Distribution Transformer Evaluation Tools***

EPA has developed a Distribution Transformer Cost Evaluation Model (DTCEM) to assist utilities in considering both the economic and environmental benefits of energy-efficient distribution transformers. Using industry-accepted methodologies based on the total owning cost (TOC) analytical method, DTCEM offers utilities an easy yet comprehensive tool that assists in the evaluation of multiple transformer bids.

EPA is currently developing a Commercial and Industrial Transformer Cost Evaluation Model (CITCEM). Similar in design to DTCEM, CITCEM enables commercial and industrial (C&I) managers to easily evaluate transformer purchases using the TOC methodology.

### ***Economic and Environmental Benefits of High-Efficiency Distribution Transformers — A Report***

In an effort to provide a general overview of high-efficiency distribution transformers, EPA developed a guidance document entitled *Transforming Dollars into Sense: The Economic and Environmental Benefits of High-Efficiency Distribution Transformers*. This document provides a brief overview of current transformer technology, utility purchasing practices, and regulatory barriers that discourage utility purchase of cost-effective, high-efficiency transformers.

In addition to the public recognition that comes with being an **ENERGY STAR Partner**, EPA will help Partners develop the technical resources to make reducing transformer losses cheaper and easier.

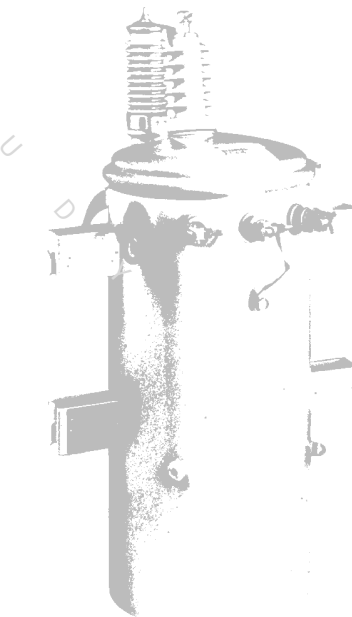


### **THE ENERGY STAR TRANSFORMER PROGRAM DOES NOT:**

**Mandate** transformer standards. The program will remain voluntary.

**Dictate** transformer evaluation practices that differ from industry standards.

**Impose** a “one-size-fits-all” evaluation methodology on member utilities.





# ANSWERS TO COMMON QUESTIONS ...

**?** What makes a transformer an **ENERGY STAR**?

EPA's goal was to set target efficiency levels for ENERGY STAR Transformers so that they represent the best current technology has to offer without restricting the choice to a specific technology. Through the manufacturing portion of the ENERGY STAR Transformer Program, EPA collected data on the efficiencies of utility transformer purchases during 1994. From these, the range of efficiency levels that were cost-effective for utilities under a variety of energy cost conditions was determined. The ENERGY STAR Transformer efficiency targets were set so that 35 percent of the units sold would qualify for the ENERGY STAR designation.

**?** Will the ENERGY STAR Transformer Program ever become **mandatory**?

**No.** The ENERGY STAR programs are built on a foundation of voluntary participation between EPA and its Partners. Under current law, the EPA has no legislative authority to mandate the purchase of high-efficiency transformers by utilities.

**?** Is the ENERGY STAR designation **specific to any technology type**?

**No.** The ENERGY STAR Transformer Program is technology neutral. Any available transformer technology can be used to meet the ENERGY STAR efficiency guidelines.

**?** What is the **difference** between the **ENERGY STAR** Transformer Program and **DOE's** ongoing efforts on distribution transformer efficiency?

As already noted, the ENERGY STAR Transformer Program is a voluntary effort to promote the use of the highest efficiency transformer technologies on the market. It is one of the options listed for consideration in DOE's Climate Challenge Options Workbook.

DOE, under a mandate from the Energy Policy Act of 1992, is investigating if efficiency *standards* for utility transformers would be cost-effective and technologically feasible. The ENERGY STAR Program and DOE's investigation into transformer standards are separate efforts.

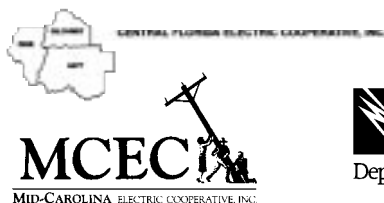
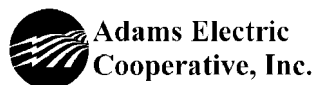
**?** How will participation in the ENERGY STAR Program change **utility purchasing options**?

The ENERGY STAR Transformer Program will require no fundamental change in the way transformers are evaluated. Utility engineers will be able to request bids and select transformer designs that meet a variety of specific system requirements. The program is designed so that ENERGY STAR Transformers will make up roughly 35 percent of the most efficient transformers sold to utilities.

# PARTNERS AND ALLIES ...

## UTILITY MEMBERS

EPA is proud to have the following companies among the Utility Members of the ENERGY STAR Transformer Program:



Transformer technologies are already in widespread use by the utility industry.



No threat to safety or reliability



Encourages U.S. ingenuity and technical know-how to improve the economy.



## ENERGY STAR MANUFACTURING PARTNERS

Transformer Manufacturing Partners agree to produce high-efficiency utility distribution transformers and to market them to their utility customers. The following Partners represent over **80 percent** of the utility distribution transformer market.



HOWARD INDUSTRIES, INC.



## ENERGY STAR ALLIES

The following Component Allies produce materials that are used in the manufacturing of high-efficiency transformers and have committed to promoting the manufacturing and purchase of high-efficiency transformers:



## ENERGY STAR ENDORSERS

The following organizations have endorsed the ENERGY STAR Transformer Program:



EDISON ELECTRIC  
INSTITUTE



National Rural Electric  
Cooperative Association



A voluntary,  
EPA-sponsored effort.



EPA will support the  
development of technical tools.



The cost of efficient  
transformers will  
decrease, positioning  
utilities for the future.





United States  
Environmental Protection  
Agency

Air and Radiation  
(6202J)

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# FOR MORE INFORMATION

For more information on the ENERGY STAR  
Transformer Program, contact:

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To learn more about EPA's other voluntary  
pollution prevention programs,  
call 1-888-STAR YES (1-888-782-7937) or visit  
the ENERGY STAR home page on the World Wide Web:  
<http://www.epa.gov/energystar.html>